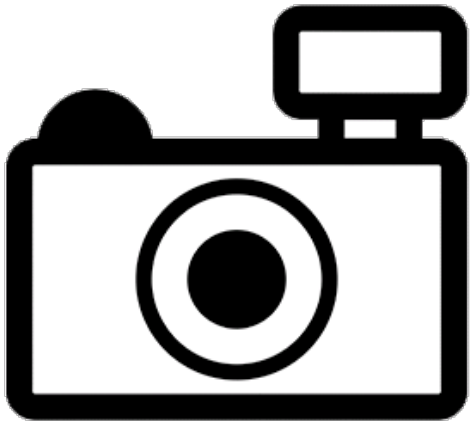
Cipangopaludina malleata (a snail, no common name)
Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, February 2022
Revised, July 2022
Web Version, 7/25/2022

Organism Type: Mollusk
Overall Risk Assessment Category: Uncertain



1 Native Range and Status in the United States

Native Range

From Reeve (1863; as *Paludina malleata*):

"Japan"

From Pilsbry (1902; as *Viviparus malleatus*):

"Mr. Iwakawa has traced this species from the Province Mutsu, at the north end of Nippon [Japan], to the middle Riukiu Islands. Mr. Hirase sends specimens from the islands also. Fig. 6 [in source material] represents a specimen from Kagoshima, Satsuma. Fig. 7 [in source material] is from a very smooth and glossy shell from Okinawa."

Status in the United States

Historical records of *C. malleata* introduction into the United States exist (sometimes under synonyms *Viviparus malleata*, *V. malleatus*, or *V. stelmaphorus*; see Taxonomic Hierarchy and Taxonomic Standing). However, no *Cipangopaludina* snail populations identified to the species level within the United States are currently identified as *C. malleata*.

From Cohen and Carlton (1995):

"The first record of introduced viviparids within the study zone [San Francisco Bay and Delta] consists of five shells at the California Academy of Sciences, labeled as *malleata*, collected from a slough near Holt in the Delta in 1938. Other specimens from within or near the Delta include eight snails collected from a canal north of Stockton in 1933, three snails from Victoria Island in 1941, eight snails from Sycamore Slough in 1946, and two undated snails from a slough near Stockton, all labeled as *malleata*. Greg[g] (1948) reported finding a few live and many broken shells of *Vivipara malleata* in irrigation ditches near Stockton, speculating that muskrat may have been eating the snails. Sorenson (1950) reported collecting *Viviparus malleatus* from an irrigation canal 60 miles northwest of Fresno in 1948."

"Hanna (1966), referred all existing western North America records to *Viviparus stelmaphorus*, based on finding enough variation in shell morphology in specimens from a single locality to encompass records that had been reported as *malleata*, *japonica*, *iwakawa* or *lecythoides*."

"Taylor (1981) assigned these various California records to two species, *Bellamya japonica* (including Wood's 1891 market specimens, Hannibal's 1911 Hanford record, and records from Mountain Lake) and *Cipangopaludina chinensis malleata* (apparently including all other California records known to him), which he listed as occurring in irrigation ditches, sloughs and ponds from the Central Valley and San Francisco Bay area to southern California."

There is no evidence of trade in *C. malleata* occurring in the United States.

Four States were found to regulate possession or trade of all species in the genus *Cipangopaludina*. Although additional States regulate individual species within the genus, no State was found to regulate possession or trade of *C. malleata*, specifically.

From State of Hawaii (2022):

"Under statutory authorities provided by Chapter 183D, Hawaii Revised Statutes, the Department of Land and Natural Resources maintains Hawaii Administrative Rules Chapter 124, which defines 'injurious wildlife' as 'any species or subspecies of animal except game birds and game mammals which is known to be harmful to agriculture, aquaculture, indigenous wildlife or plants, or constitute a nuisance or health hazard and is listed in the exhibit entitled "Exhibit 5, Chapter 13-124, List of Species of Injurious Wildlife in Hawaii…" ' "

"Injurious Wildlife Species
[…] All species in the genera: *Pomacea*, *Pila*, and *Cipangopaludina* […]"

From Code of Maryland Regulations (2021):

"A person may not import, transport, purchase, propagate, sell, or release into State waters the following nonnative aquatic organisms: […] Chinese mystery snail (Cipangopaludina chinensis, Viviparus malleatus) [sic] […]"

From MN DNR (2022):

"It is legal to possess, sell, buy, and transport regulated invasive species, but they may not be introduced into a free-living state, such as being released or planted in public waters. The regulated invasive species are: […] *Cipangopaludina spp.* […]"

From Missouri Secretary of State (2022):

"Prohibited species may not be imported, exported, transported, sold, purchased, or possessed alive in Missouri without written approval of the director."

"For the purpose of this rule, prohibited species of wildlife shall include the following: […] mystery snails of the genus *Cipangopaludina*."

Means of Introductions in the United States

There are no known introductions of *C. malleata* to the United States.

Remarks

This report follows the World Register of Marine Species (MolluscaBase 2022a) in treating *C. malleata* as a distinct and valid species and in determining its taxonomic synonyms. However, many sources synonymize this species or its synonyms with *Cipangopaludina chinensis* (e.g., Cohen and Carlton 1995; Kingsbury et al. 2021; GISD 2022; Kipp et al. 2022). A separate Ecological Risk Screening Summary is available for *C. chinensis*, the Chinese mystery snail (USFWS 2018). Every effort has been made to avoid including information pertaining to *C. chinensis* within this report. All valid synonyms of *C. malleata*, according to MolluscaBase (2022a; see Taxonomic Hierarchy and Taxonomic Standing), were used to find information on *C. malleata* for this report.

From Kipp et al. (2022):

"Taxonomy of the introduced populations of mysterysnails from Asia is confusing and there are many scientific names in use."

From Hirano et al. (2019):

"In viviparid snails there are some taxonomic issues. For example, the type species of *Cipangopaludina*, Hannibal, 1912 is *C. malleata* (Reeve, 1863) described as from Japan, but the detailed type locality of *C. malleata* was not identified in the description (Hirano et al., 2019). Habe (1976), Pilsbry (1902), and Ponder, Hallan, Shea, and Clark (2016) suggested that this species is synonymous with *C. laeta* (Martens, 1861) or *C. chinensis* (Gray, 1834)."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From MolluscaBase (2022a):

"Animalia (Kingdom) > Mollusca (Phylum) > Gastropoda (Class) > Caenogastropoda (Subclass) > Architaenioglossa (Order) > Viviparoidea (Superfamily) > Viviparidae (Family) > Bellamyinae (Subfamily) > *Cipangopaludina* (Genus) > *Cipangopaludina malleata* (Species)"

"Status: accepted"

"Synonymized names:
Paludina abbreviata Reeve, 1863 · unaccepted (junior synonym)
Paludina malleata Reeve, 1863 · unaccepted (original combination)
Paludina stelmaphora Kobelt, 1879 · unaccepted (junior synonym)
Vivipara malleata (Reeve, 1863) · unaccepted (unaccepted combination)
Vivipara stelmaphora Kobelt, 1879 · unaccepted (junior synonym)
Viviparus malleatus (Reeve, 1863) · unaccepted (unaccepted combination)"

Size, Weight, and Age Range

No information available.

Environment

No information available.

Climate

No information available.

Distribution Outside the United States

Native

From Reeve (1863; as *Paludina malleata*):

"Japan"

From Pilsbry (1902; as *Viviparus malleatus*]):

"Mr. Iwakawa has traced this species from the Province Mutsu, at the north end of Nippon [Japan], to the middle Riukiu Islands. Mr. Hirase sends specimens from the islands also. Fig. 6 [in source material] represents a specimen from Kagoshima, Satsuma. Fig. 7 [in source material] is from a very smooth and glossy shell from Okinawa."

Introduced
No known introductions.

Means of Introduction Outside the United States
No known introductions.

Short Description
From Reeve (1863; as *Paludina malleata*):

"Shell globosely conical, rather inflated, bright olive, whorls rounded, longitudinally copiously plicately striated, spirally obscurely linearly punctured, everywhere malleated; aperture pyriformly ovate, lip black-edged."

Biology
From MolluscaBase (2022b):

"**Functional group** benthos […]
Feedingtype [sic] grazer […]
Feedingtype [sic] filter feeder […]"

Human Uses
No information available.

Diseases
No OIE-reportable diseases (OIE 2021) have been documented for this species.

From Shiota et al. (1980):

"Of 13 species of mollusc exposed to *Angiostrongylus cantonensis* larvae, only 6 (*Lymnaea japonica, L. ollula, Physa acuta, Gyraulus hiemantium, Cipangopaludina malleata* (juveniles only) and *Taia (Sinotaia) histrica* (juveniles only)) permitted larval development up to the 3rd stage. The larvae from the first 5 species were infective to rats. Development to the 2nd stage occurred in *C. malleata* and *T. (S.) histrica* adults and in *Parafossarulus manchouricus* and *Semisulcospira libertina*. No development occurred in the remaining 5 species."

From Chai et al. (2009):

"This echinostome [*Echinostoma macrorchis* Ando & Ozaki, 1923] was originally described from rats, *Rattus rattus* and *Rattus norvegicus*, in Japan [Ando and Ozaki 1923]. […] Freshwater snails, *Segmentina nitiella* and *Planorbis compressus japonicus* shed the cercairae and also harbor the metacercariae [Rim 1982]. Other snails, *Cipangopaludina malleata*, *Cipangopaludina japonica*, *S. nitiella*, *Viviparus malleatus*, and the frog *Rana sp.* also harbor the metacercariae [Yu and Mott 1994]."

Threat to Humans
No information available.

3 Impacts of Introductions
Purported introductions of *C. malleata* to the United States are currently understood to be another species. There is no information on impacts of introduction.

Hawaii (State of Hawaii 2022), Maryland (Code of Maryland Regulations 2021), Minnesota (MN DNR 2022), and Missouri (Missouri Secretary of State 2022) regulate possession or trade of all species in the genus *Cipangopaludina*.

4 History of Invasiveness
The history of invasiveness is classified as No Known Nonnative Population. *C. malleata* was reported to be introduced into the United States, but these may have been misidentifications due to the complexity of identifying species in the *Cipangopaludina* genus, and none of the U.S. populations are currently identified as *C. malleata*. No introductions are known elsewhere in the world. Additionally, there is no evidence of trade in this species.

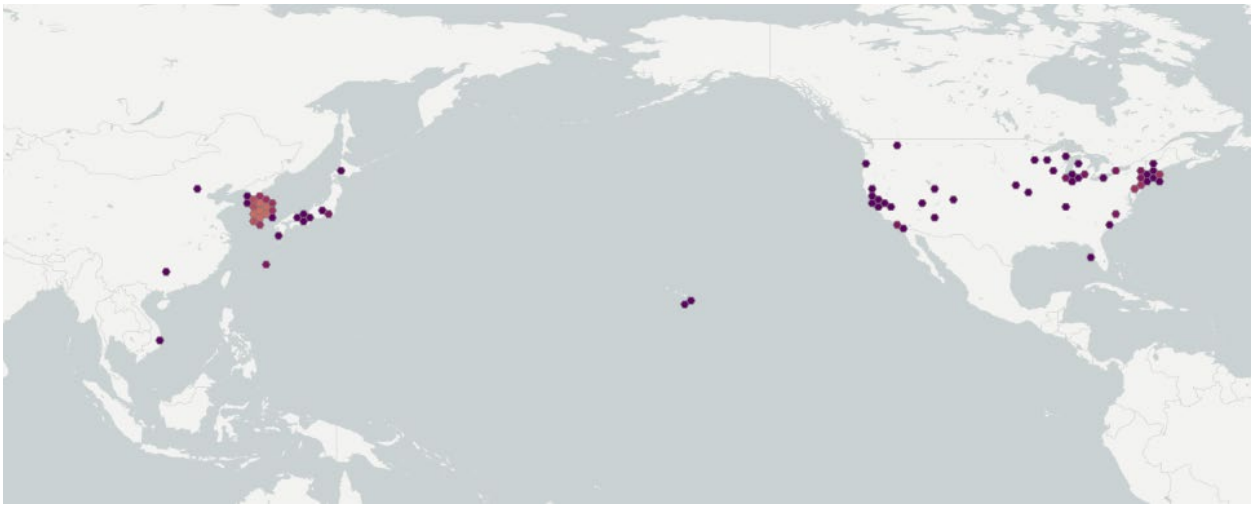
5 Global Distribution


Figure 1. Known global distribution of *Cipangopaludina malleata*. Observations are reported from Eastern Asia (China, Vietnam, Japan and the Republic of Korea) and North America (Canada and the United States, including Hawaii). Map from GBIF Secretariat (2021).

Reported occurrences in Canada, the United States, China, Vietnam and the Republic of Korea (GBIF Secretariat 2021) were not included in the climate matching analysis because establishment of *C. malleata* in these locations could not be confirmed. Due to the significant taxonomic uncertainty associated with this species, the occurrences reported by GBIF Secretariat (2021) could be misidentifications of other, similar species.

6 Distribution Within the United States

There are no known introductions of *C. malleata* to the United States. Reported occurrences are currently viewed as misidentifications of other, similar species.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *C. malleata* in the contiguous United States was high along the southeast Atlantic coast and from the western Ozarks into the southeastern Great Plains with small, scattered areas of high match along the Gulf Coast, in the Appalachian Mountains, and along the U.S.-Canada border in the Northeast. The highest climate match was found in coastal North Carolina and South Carolina. In general, the rest of the country east of the Rocky Mountains showed a medium climate match, although there were three significant areas of low or medium-low match: the inland Southeast centered on Tennessee, coastal New England, and a region extending from northern Minnesota to Montana and eastern Wyoming. The Rocky Mountains and areas further west showed a low climate match with occasional scattered areas of medium match. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) for the contiguous United States was 0.275, high (scores of 0.103 and greater are classified as high). Most States had high individual climate matches. The individual climate match was medium for Colorado, Connecticut, Michigan, Nebraska, New Mexico, New York, and Wisconsin. The individual climate match was low for Arizona, California, Idaho, Massachusetts, Minnesota, Montana, North Dakota, Nevada, Oregon, Rhode Island, South Dakota, Utah, Washington, and Wyoming.

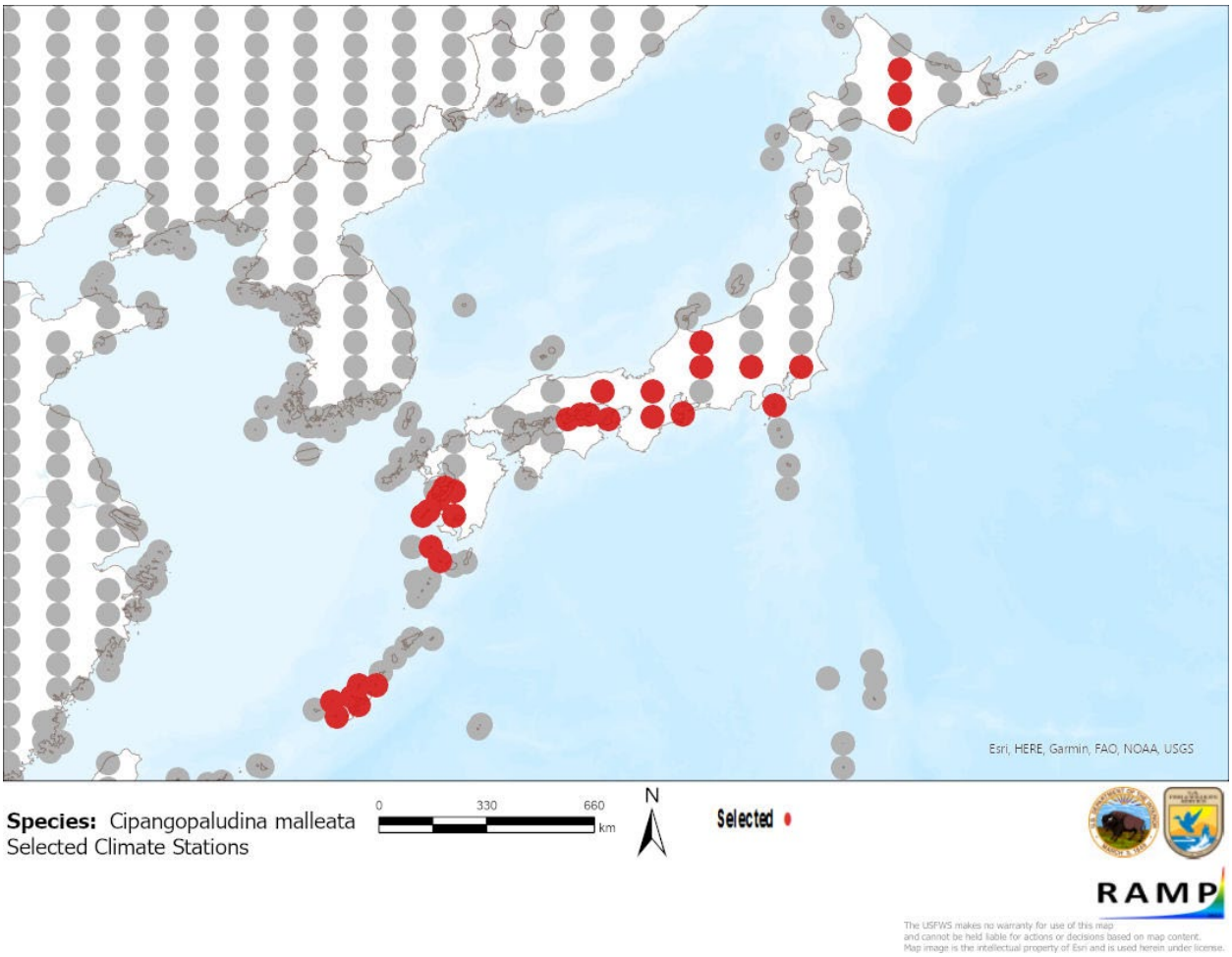


Figure 2. RAMP (Sanders et al. 2021) source map showing weather stations in East Asia selected as source locations (red; Japan) and non-source locations (gray) for *Cipangopaludina malleata* climate matching. Source locations from GBIF Secretariat (2021). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

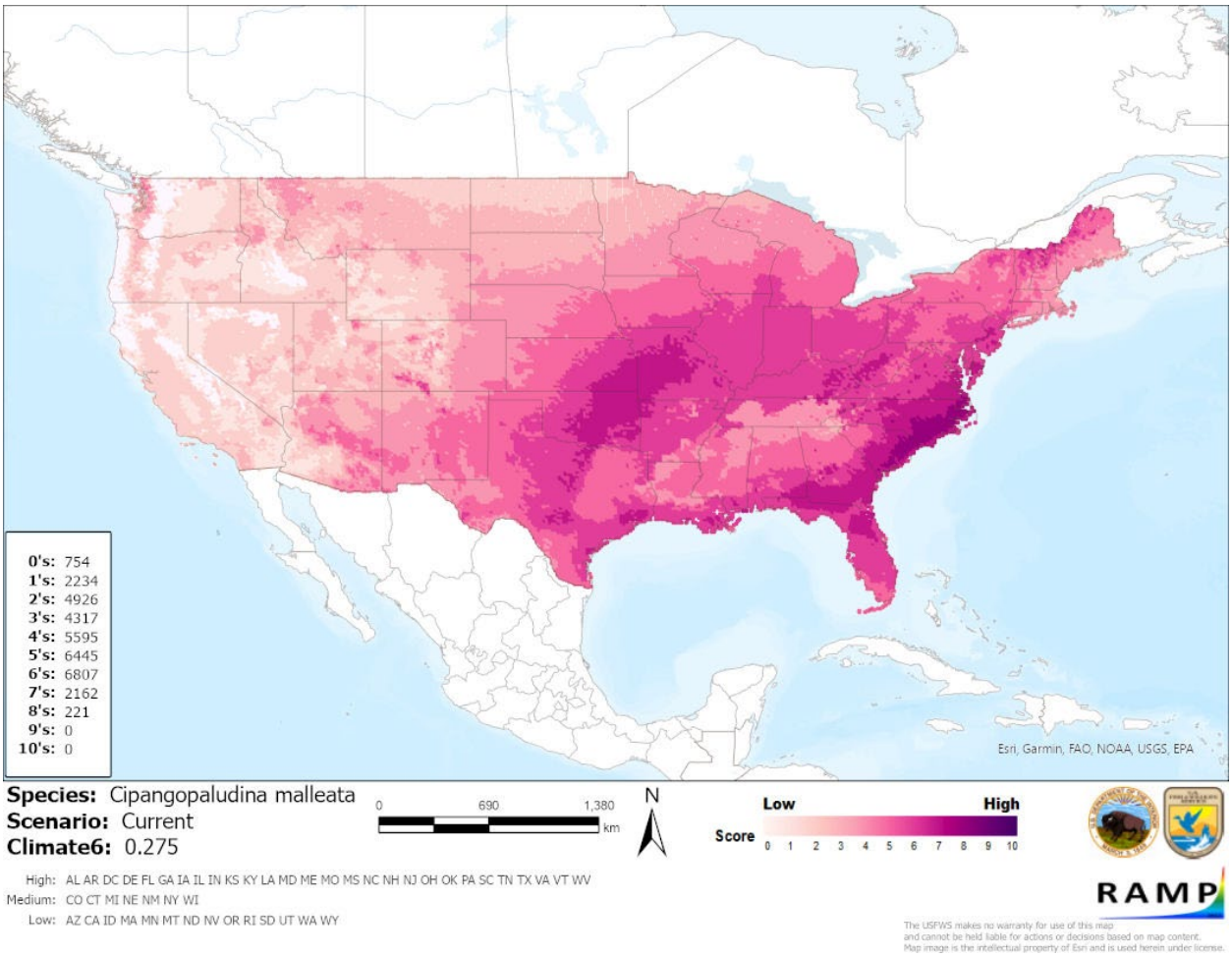


Figure 3. Map of RAMP (Sanders et al. 2021) climate matches for *Cipangopaludina malleata* in the contiguous United States based on source locations reported by GBIF Secretariat (2021). Counts of climate match scores are tabulated on the left. 0/Light Pink = Lowest match, 10/Dark Purple = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: (Count of target points with climate scores 6-10)/ (Count of all target points)	Overall Climate Match Category
0.000≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

8 Certainty of Assessment

Extremely limited information is available on the biology and ecology of *C. malleata*. There is no information on impacts of introduction because of the lack of confirmed introduction history. There is significant taxonomic uncertainty surrounding this species with historic reports of this species now believed to be misidentifications. Because of the taxonomic uncertainty and history

of misidentification, the currently available information on distribution may be incomplete, reducing confidence in the climate matching analysis built on that information. The certainty of the assessment is low.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Cipangopaludina malleata is a species of mysterysnail described from various locations in Japan. Very little information is available on this species and there is much taxonomic uncertainty surrounding mysterysnails. Four States regulate the possession and trade of all species within the genus *Cipangopaludina*. Purported introductions of *C. malleata* into the United States are now considered to represent introductions of *C. chinensis*, and no other introductions have been documented globally. Therefore, the history of invasiveness is classified as No Known Nonnative Population. The climate match with the United States is high overall, with the highest matches occurring along the southeastern Atlantic coast. Much of the eastern United States has a high or medium match. The certainty of assessment is low due to the lack of information on impacts of introduction and taxonomic uncertainty. The overall risk assessment category for *C. malleata* is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): No Known Nonnative Population**
- **Overall Climate Match Category (Sec. 7): High**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information: Many authors consider *C. malleata* to be a synonym of *C. chinensis.***
- **Overall Risk Assessment Category: Uncertain**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 11.

Chai JY, Shin EH, Lee SH, Rim HJ. 2009. Foodborne intestinal flukes in Southeast Asia. Korean Journal of Parasitology 47, Supplement:S69–S102.

Code of Maryland Regulations. 2021. Classification of nonnative aquatic organisms. Code of Maryland Regulations section 08.02.19.04.

Cohen AN, Carlton JT. 1995. Nonindigenous aquatic species in a United States estuary: a case study of the biological invasions of the San Francisco Bay and Delta. Report to the United States Fish and Wildlife Service, Washington, D.C., and the National Sea Grant College Program, Connecticut Sea Grant.

GBIF Secretariat. 2021. GBIF backbone taxonomy: *Cipangopaludina malleata* (Reeve, 1863). Copenhagen: Global Biodiversity Information Facility. Available: https://www.gbif.org/species/8266612 (July 2022).

[GISD] Global Invasive Species Database. 2022. Species profile: *Cipangopaludina chinensis*. Gland, Switzerland: Invasive Species Specialist Group. Available: http://www.iucngisd.org/gisd/species.php?sc=1812 (July 2022).

Hirano T, Saito T, Chiba S. 2015. Phylogeny of freshwater viviparid snails in Japan. Journal of Molluscan Studies 81:435–441.

Hirano T, Saito T, Tsunamoto Y, Koseki J, Prozorova L, Do VT, Matsuoka K, Nakai K, Suyama Y, Chiba S. 2019. Role of ancient lakes in genetic and phenotypic diversification of freshwater snails. Molecular Ecology 28:5032–5051.

Kingsbury SE, McAlpine DF, Cheng Y, Parker E, Campbell LM. 2021. A review of the non-indigenous Chinese mystery snail, *Cipangopaludina chinensis* (Viviparidae), in North America, with emphasis on occurrence in Canada and the potential impact on indigenous aquatic species. Environmental Reviews 29:182–200.

Kipp RM, Benson AJ, Larson J, Fusaro A, Morningstar C. 2022. *Cipangopaludina chinensis* (Gray, 1834). Gainesville, Florida: U.S. Geological Survey, Nonindigenous Aquatic Species Database. Available: https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=1044 (July 2022).

Minnesota Department of Natural Resources. 2022. Minnesota invasive species laws. Saint Paul, Minnesota: Minnesota Department of Natural Resources. Available: https://www.dnr.state.mn.us/invasives/laws.html#prohibited (July 2022).

Missouri Secretary of State. 2022. Prohibited species. Missouri Code of State Regulations section 3, division 10-4.117.

MolluscaBase, editors. 2022a. *Cipangopaludina malleata* (Reeve, 1863). World Register of Marine Species. Available: https://www.marinespecies.org/aphia.php?p=taxdetails&id=758902 (February 2022).

MolluscaBase, editors. 2022b. *Cipangopaludina malleata* (Reeve, 1863). MolluscaBase. Available: http://www.molluscabase.org/aphia.php?p=taxdetails&id=758902 (July 2022).

[OIE] World Organisation for Animal Health. 2021. Animal diseases. Available: https://www.oie.int/en/what-we-do/animal-health-and-welfare/animal-diseases/ (May 2021).

Pilsbry HA. 1902. Revision of Japanese Viviparidæ, with notes on *Melania* and *Bithynia*. Proceedings of the Academy of Natural Sciences of Philadelphia 54:115–121.

Reeve LA. 1863. Monograph of the genus *Paludina*. Conchologia Iconica, or, illustrations of the shells of molluscous animals. Volume 14. London: L. Reeve & Co.

Sanders S, Castiglione C, Hoff M. 2021. Risk Assessment Mapping Program: RAMP. Version 4.0. U.S. Fish and Wildlife Service.

Shiota T, Arizono N, Yamada M, Kurimoto H, Shimada Y, Yoshida Y. 1980. Experimental infections of 13 species of Japanese freshwater molluscs with *Angiostrongylus cantonensis* larvae. Japanese Journal of Parasitology 29:27–38. (In Japanese with English summary.)

State of Hawaii. 2022. Injurious wildlife. Honolulu: Hawaii Division of Forestry and Wildlife: Wildlife Program. Available: https://dlnr.hawaii.gov/wildlife/invasives/injurious-wildlife/ (July 2022).

[USFWS] U.S. Fish and Wildlife Service. 2018. Chinese mystery snail (*Cipangopaludina chinensis*) Ecological Risk Screening Summary. U.S. Fish and Wildlife Service. Available: https://www.fws.gov/sites/default/files/documents/Ecological-Risk-Screening-Summary-Chinese-Mystery-Snail.pdf (July 2022).

11 Literature Cited in Quoted Material

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

Ando R, Ozaki Y. 1923. On four new species of trematodes of the family Echinostomatidae. Dobutsugaku Zasshi 35:108–119.

Gregg WO. 1948. Collecting land snails on the west side of the Sierra Nevada. Minutes of the Conchological Club of Southern California 76(Jan):2–7.

Habe T. 1976. Type specimens of *Cyclophorus herklotsi* and *Cipangopaludina malleata*. Chiribotan 9:46.

Hanna GD. 1966. Introduced mollusks of western North America. Occasional Papers of the California Academy of Sciences 48.

Hirano T, Saito T, Tsunamoto Y, Koseki J, Ye B, Do VT, Miura O, Suyama Y, Chiba S. 2019. Enigmatic incongruence between mtDNA and nDNA revealed by multi-locus phylogenomic analyses in freshwater snails. Scientific Reports 9:6223.

Ponder WF, Hallan A, Shea M, Clark SA. 2016. Australian freshwater molluscs. Available: http://keys.lucidcentral.org/keys/v3/freshwater_molluscs/

Rim HJ. 1982. Echinostomiasis. Pages 53-69 in Trematode zoonoses. CRC Handbook Series in Zoonoses, Section C: Parasitic Zoonoses. Volume III. Boca Raton, Florida: CRC Press Inc.

Sorenson A. 1950. [Letter reprinted.] Minutes of the Conchological Club of Southern California 98(Mar):1–2.

Taylor DW. 1981. Freshwater mollusks of California: a distributional checklist. California Fish and Game 67:140-163.

Yu SH, Mott KE. 1994. Epidemiology and morbidity of food-borne intestinal trematode infections. Tropical Diseases Bulletin 91:R125-R152.